

AMENDMENT

This listing of claims will serve to replace all prior versions and listings of claims in the present application:

1. (Currently amended): A process for the removal of contaminants from a surface of a substrate requiring precision cleaning, comprising: (a) applying at least one fluid to the substrate surface, the fluid selected from the group consisting of a liquid having a vapor pressure greater than 5 KPa at 25°C, a reactive gas of the type which reacts with the contaminants, and vapor of a reactive liquid of the type which reacts with the contaminants; and (b) cleaning the substrate surface with a cryogenic stream selected from a cryogenic particle stream, a cryogenic gas stream, a cryogenic liquid stream and combinations thereof; wherein the liquid is applied for remaining on the substrate surface in a layer of at least 5 angstroms for less than 10 minutes and preferably less than 2 minutes to evaporate and any condensation from the reactive gas and the vapor is provided as a liquid film on the substrate surface to reduce adhesion of the contaminants and evaporate prior to the cleaning with the cryogenic stream.
2. (Previously amended): The process of claim 1 wherein (a) and (b) are carried out simultaneously.
3. (Previously amended): The process of claim 1 wherein (a) and (b) are carried out sequentially.
4. (Previously amended): The process of claim 1 wherein the at least one fluid is the liquid selected from the group consisting of ethanol, acetone, ethanol-acetone mixtures, isopropyl alcohol, methanol, methyl formate,

methyl iodide, ethyl bromide, acetonitrile, ethyl chloride, pyrrolidine, tetrahydrofuran and mixtures thereof.

5. (Previously amended): The process of claim 1 wherein the at least one fluid is the vapor selected from the group of liquids consisting of ethanol, acetone, ethanol-acetone mixtures, isopropyl alcohol, methanol, methyl formate, methyl iodide, ethyl bromide, and mixtures thereof.
6. (Previously amended): The process of claim 1 wherein the at least one fluid is the reactive gas selected from the group consisting of ozone, water vapor, hydrogen, nitrogen, nitrogen oxides, nitrogen trifluoride, helium, argon, neon, sulfur trioxide, oxygen, fluorine, fluorocarbon gases and mixtures thereof.
7. (Previously amended): The process of claim 1 wherein the at least one fluid is the reactive gas or the vapor selected from the group consisting of isopropyl alcohol, ethanol-acetone mixtures, methanol, ozone, water vapor, nitrogen trifluoride, sulfur trioxide, oxygen, fluorine and fluorocarbon gases, and mixtures thereof.
8. (Previously amended): The process of claim 1 wherein the at least one fluid remains in contact with the surface for up to 10 minutes prior to the cleaning.
9. (Previously amended): The process of claim 8 wherein the at least one fluid remains in contact with the surface for less than 2 minutes prior to the cleaning.
10. (Original): The process of claim 1 wherein the contaminants are less than 0.76 μm in size.
11. Canceled.

12. (Previously amended): The process of claim 1 wherein the liquid has a freezing point below about -50°C .
13. (Previously amended): The process of claim 1 wherein the liquid has a dipole moment of greater than about 1.5 D.
14. Canceled.
15. (Previously amended): The process of claim 4 further comprising the liquid removing bulk water from the substrate surface.
16. (Previously amended): The process of claim 1 wherein the substrate surface is selected from a semiconductor, metal and dielectric film.
17. (Previously amended): The process of claim 1 wherein the at least one fluid is selected from the reactive gas and the vapor which reacts with the contaminants on the substrate surface to form a volatile gaseous byproduct; and further comprising: maintaining the reactive gas or the vapor in contact with the substrate surface for up to 20 minutes, and removing the gaseous byproduct prior to the cleaning.
18. (Currently amended): The process of claim 17 wherein the reactive gas or the vapor is introduced in a chamber containing the substrate at a pressure below ~~atmosphere~~ atmospheric pressure and at temperatures of up to 200°C .
19. (Previously amended): The process of claim 18 wherein removing the byproduct comprises purging the chamber with a gas selected from nitrogen and clean dry air.
20. (Previously amended): The process of claim 17 wherein the at least one fluid is applied to the substrate surface in the presence of a free radical initiator selected from ultraviolet light, x-ray, laser, corona discharge and

plasma to generate reactive chemical species to increase reactivity with the contaminants.

21. Canceled.